

Bureau of Land Management

Science Plan

Draft Working Document

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Introduction

The Bureau of Land Management (BLM) receives many requests each year to communicate its science needs to a number of science providers both within and outside the Federal government. Historically, the BLM has responded to these calls for information with individual program information rather than a single, coordinated Bureauwide response.

In FY 2000, the BLM Science Coordination Committee recognized the need for a unified, comprehensive science strategy that would enable the Bureau to proactively identify, prioritize, and communicate both its short-term and long-term science needs. The Committee reported its findings to BLM's Executive Leadership Team, which subsequently approved preparation of a science plan. The resulting document, this *Bureau of Land Management Science Plan*, provides an overall science strategy rooted firmly in BLM's strategic planning process.

The BLM's Science Plan has three primary objectives. The first is to clearly delineate the role of science in BLM decision making and public land management. Scientific information, combined with social/economic values, political factors, and legislative/regulatory requirements, will guide BLM managers in making land and resource management decisions.

A second objective is to establish a clear process for identifying science information needs and priorities. By using BLM's long-range Strategic Plan to derive specific management issues requiring science input, the Bureau's objective is to "stay ahead of the curve," acquiring scientific information that is relevant, focused, and timely. Key to this effort will be the development of a unified, prioritized catalog of science needs on both a national and regional basis. This catalogue, which will be updated yearly, will help the Bureau reach out proactively to science providers such as the U.S. Geological Survey as well as enabling the BLM to respond quickly to inquiries/data calls from researchers.

The third objective is to develop a strategy for communicating the Bureau's science needs, sharing science information/results, and highlighting science opportunities on BLM-managed public lands. This communications outreach will include BLM management and staff, various science providers, other technical/interest groups, and the general public.

"Science" within the Bureau is often thought of in terms of research, especially biological research. This Science Plan broadens BLM's interpretation of "science" to include information that may be in the form of data, resource inventories, resource monitoring, or research results. BLM's definition of science encompasses the earth (physical) sciences and social sciences as well as the biological sciences.

The Science Plan consists of four main sections. The first section discusses the role of science in the BLM; legislative mandates are outlined and the complex factors and interactions involved in decision making are described. The second section sets forth a process for identifying and prioritizing BLM's science needs and merging them into a national/regional needs catalogue that can be shared with science providers such as the U.S. Geological Survey.

The third section of the Science Plan discusses how the BLM can communicate its science needs to science providers and share scientific research or study results both internally and externally. The fourth section describes the myriad opportunities for scientific activities on BLM's 264 million surface acres of public lands.

The Role of Science in BLM

A critical first step in developing a science plan is to articulate the role of science in BLM, particularly in land-use planning and management decisionmaking processes. It is important to understand how science is intended to be used in making land and resource management decisions and how it relates to other information in the decisionmaking process.

Science is defined in the *Webster's New World Dictionary* as “the state or fact of knowledge; systematized knowledge derived from observation, study, and experimentation carried on in order to determine the nature or principles of what is being studied.” Science should represent an objective, unbiased investigation into the subject being studied. As part of the scientific process, scientists obtain, analyze, and categorize information that, in turn, can be used by land and resource managers to interpret the potential consequences of management decisions.

Legislative and Regulatory Requirements

Science provides the information that BLM needs to meet various legislative and regulatory requirements. The National Environmental Policy Act of 1969 (NEPA) states that “...a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences” shall, to the fullest extent possible, be utilized in planning and decision making that may have an impact on man’s environment (Sec.102(a)).

The Federal Land Policy and Management Act of 1976 (FLPMA) refers in numerous places to science information and implies the need for scientific data to adequately implement the intent of the statute. FLPMA states that “. . . a systematic interdisciplinary approach to achieve integrated consideration of physical, biological, economic, and other sciences . . .” shall be used in developing and revising land use plans (Sec.202.(c)(2)). Each of these mandates implies the use of credible information and a scientific basis for making judgments, comparisons, and analyses. FLPMA also indicates that “....investigations, studies, and experiments,in cooperation with others, involving the management, protection, development, acquisition, and conveying of the public lands may be conducted (Sec.307(a))”.

The Bureau Strategic Plan for Fiscal Year 2001-2005 builds on BLM’s Blueprint for the Future and BLM’s 1997 Strategic Plan. The mission statement in the fiscal year 2001-2005 plan states in part that BLM will “... sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.” The plan is organized around three broad categories: (1) serve current and future publics, (2) restore and maintain the health of the land, and (3) improve organizational effectiveness. These goal categories are made more specific as mission goals/program activities (Figure 1).

There are many additional legislative and regulatory requirements that support the concept of using scientific information in carrying out the Bureau’s mission. Much of the Bureau’s mandate can be carried out only with the use of credible science. “Credible science” refers to scientific information that has been obtained through accepted professional practices and protocols and research results that have been subjected to peer review.

MISSION Sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations		
GOAL 1.0 <i>Serve current and future publics</i>	GOAL 2.0 <i>Restore and maintain the health of the land</i>	GOAL 3.0 <i>Improve organizational effectiveness</i>
Mission Goals/Program Activities	Mission Goals/Program Activities	Internal Objectives
Provide opportunities for environmentally responsible recreation Provide opportunities for environmentally responsible commercial activities Preserve natural and cultural heritage resources Reduce threats to public health, safety, and property Improve land, resource, and title information Provide economic and technical assistance	Understand the condition of the public lands Restore at-risk resources and maintain functioning systems	Provide excellence in customer service Increase partnerships, challenge cost-share arrangements, and other collaborative efforts Improve management systems Recover appropriate costs of providing services Improve management and leadership Improve the diversity and skills of BLM's workforce

Figure 1. Mission statement, goals, and program activities of the Bureau.

The Context for Science in Land Management Decision Making

Natural, physical, economic, and social science information is needed by the BLM to support its compliance with legislative mandates and regulatory requirements, and to enable the BLM to implement sound management actions. Science is also needed to help identify management goals and needs. The science that is needed at any one time and place depends on the specific issues and needs at the moment under the existing circumstances. The process of obtaining scientific information should be proactive and not just reactive to issues and needs.

The state of natural resource science is insufficient to give definitive cause-effect predictions to the decision maker. Alan McQuillan noted in the January 2000 issue of the *Journal of Forestry* (p.46) that “science can tell us how things are and how they work, but science alone can never tell us what we

ought to do.” There will always be unknowns and uncertainties, and decision outcomes can never be expressed as more than probabilities. Science may reduce the level of uncertainty regarding future events but cannot completely eliminate it. Science, along with other kinds of information, is just one component of decision making.

Science is useful for evaluating alternatives and estimating outcomes, although it is not the determining factor in making decisions. However, the use of the best-available science – along with the appropriate balance of political, social, and economic information/considerations – will result in the best-informed decisions at the time. Through an adaptive management process, BLM managers can update information and knowledge over time and adjust their decisions to better fit current scenarios, on-the-ground conditions, and available management options.

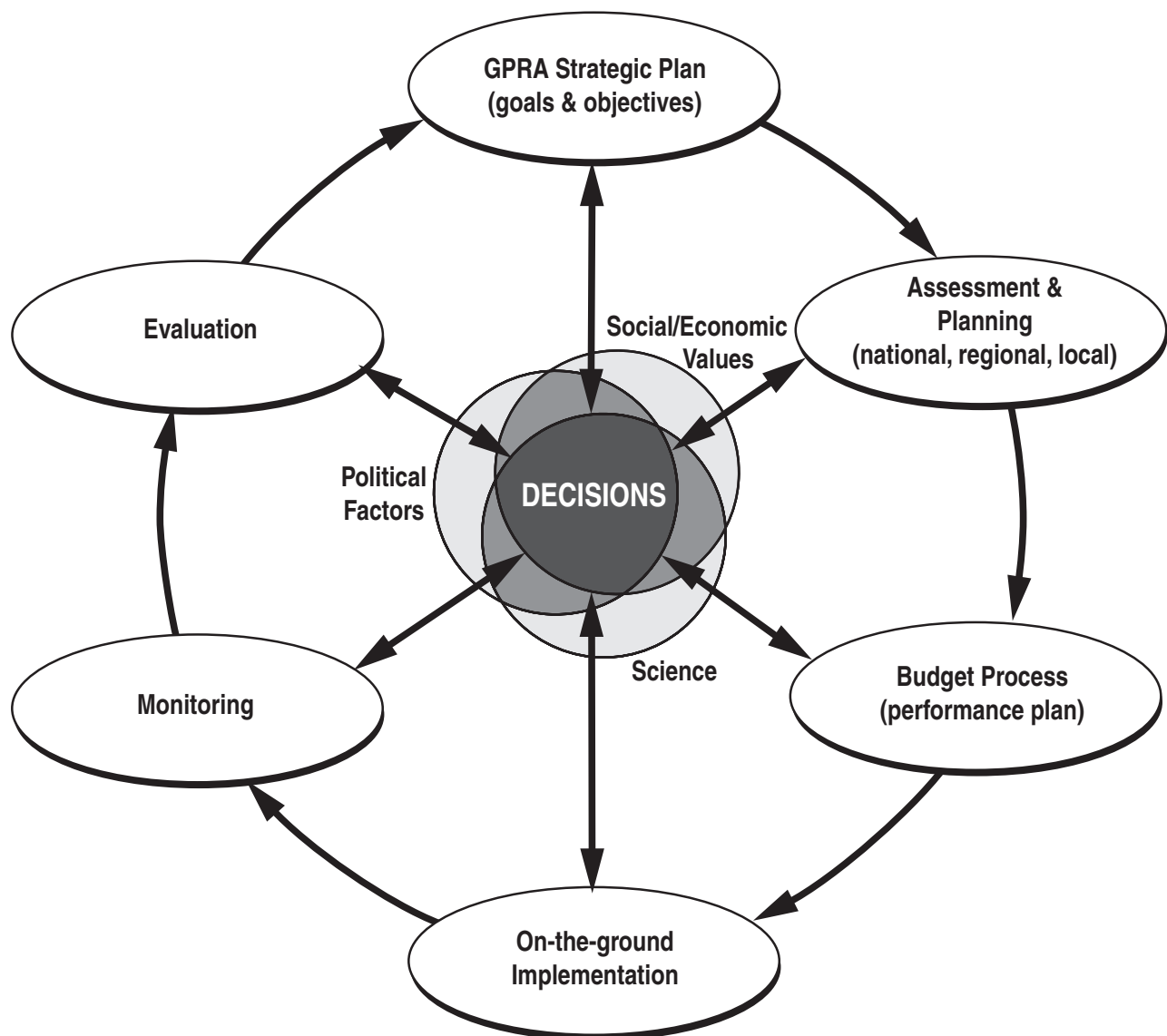


Figure 2. Science and decision making in the BLM.

The relationship of science to other BLM processes and sources of information is shown in Figure 2. The BLM will develop its science strategy as an integral part of the overall mission strategy. Figure 2 illustrates the myriad forces involved in BLM decision making. In this model, science is aligned with mission work while recognizing the tremendous effect that political factors and social/economic values have on BLM's approach to managing public lands. Science by itself cannot provide all of the answers, even though it is a critical component in accomplishing the Bureau's mission. Scientific data is not the only influence on decision making, and the Bureau is constantly required to balance one interest or benefit against another.

At each step in the process shown in Figure 2, there are decisions at various levels being made. There is also an almost constant information flow between the numerous steps of the process.

Time and Scale Considerations

Decision makers acquire science differently, depending on the amount of time they have to make their decision. If the time frame is short (less than 1 year), a tactical approach may need to be taken that involves acquiring only readily available science. As the time frame lengthens, the ability to acquire more detailed scientific information increases. Lead times on the order of two to five years or longer may be necessary for planning and conducting research, acquiring data, or performing inventories. This Science Plan provides the Bureau with the opportunity to both address science needs at the tactical level and develop scientific information at the strategic level.

Science considerations also vary by scale. The type of information needed at the national scale is far different than that needed at the regional or local level. National issues normally require information that is general in nature and possibly a summary of more detailed information from many sources. Local issues, on the other hand, normally require more site-specific information and more detailed biological, physical, social, and political input.

The process described in the next section accommodates national, regional, and local time and scale needs.

BLM's Science Process

BLM's science process is a sequential ten-step process that begins with the Bureau's Strategic Plan, which is nationwide in scope, and then proceeds to the regional and local levels (Figure 3). National management issues will first be derived from overall strategic mission goals.

The next step will be to take management issues and express them in a regional context. For instance, a national management issue for invasive weeds would need to be focused on specific invasive weed problems in each particular region; weed species needing to be addressed could vary considerably from region to region.

The specific science information needs for each issue will then be determined. Science information needs can include resource inventories, various spatial/nonspatial data sets, resource monitoring studies, and new research needed to fill in data gaps and assist decision makers. Science needs and priorities will be identified to address all of the various management needs in each individual region. In some cases, a regional issue/need may be important enough to be elevated to a national issue/need. If additional issues are identified that are not directly tied to a national management issue, they will also be included at this point. In addition, tactical science needs, i.e., local issues that need immediate attention, will be identified and prioritized.

Once all BLM regional assessments have been completed, they will be aggregated into one document that will address both regional and national science needs and priorities. This aggregation of information will provide the Bureau with a complete catalog of science needs and priorities that will be used in several ways. At the national level, the catalog will be used to communicate the Bureau's needs and priorities to national science providers. At the regional level, the catalog will be used to communicate the Bureau's needs to regional science partners, including other agencies, universities, and other interested providers within the region. At the local level, the catalog will be used to communicate BLM's science needs to principal researchers and others who can help acquire the information that the Bureau needs.

For a more complete, detailed narrative of BLM's science process, refer to Appendix 1. For a discussion on communicating science needs and sharing results, refer to the following section of this plan.

Biogeographic Regions

The biogeographic regions selected to identify management issues and science needs are shown in Figure 4. In choosing these regions, the BLM evaluated several administrative and political, as well as ecological or resource-based, delineations. Biogeographic regions were chosen to help organize and catalog national, regional, and local management issues and related science needs.

Biogeographic regions are not meant to be rigid or inviolate. They are simply a means of identifying and grouping management issues and science needs in a way that is understandable and logical, and that allows BLM to address science issues and needs in a comprehensive way. They also provide a geographical context for framing management issues and a means of grouping research and science needs. This will be very helpful in identifying partners, science providers, and interested parties for current issues. In addition, they will provide a mechanism for developing and grouping regionally important management issues, and for using ecosystem and adaptive management approaches and principles.

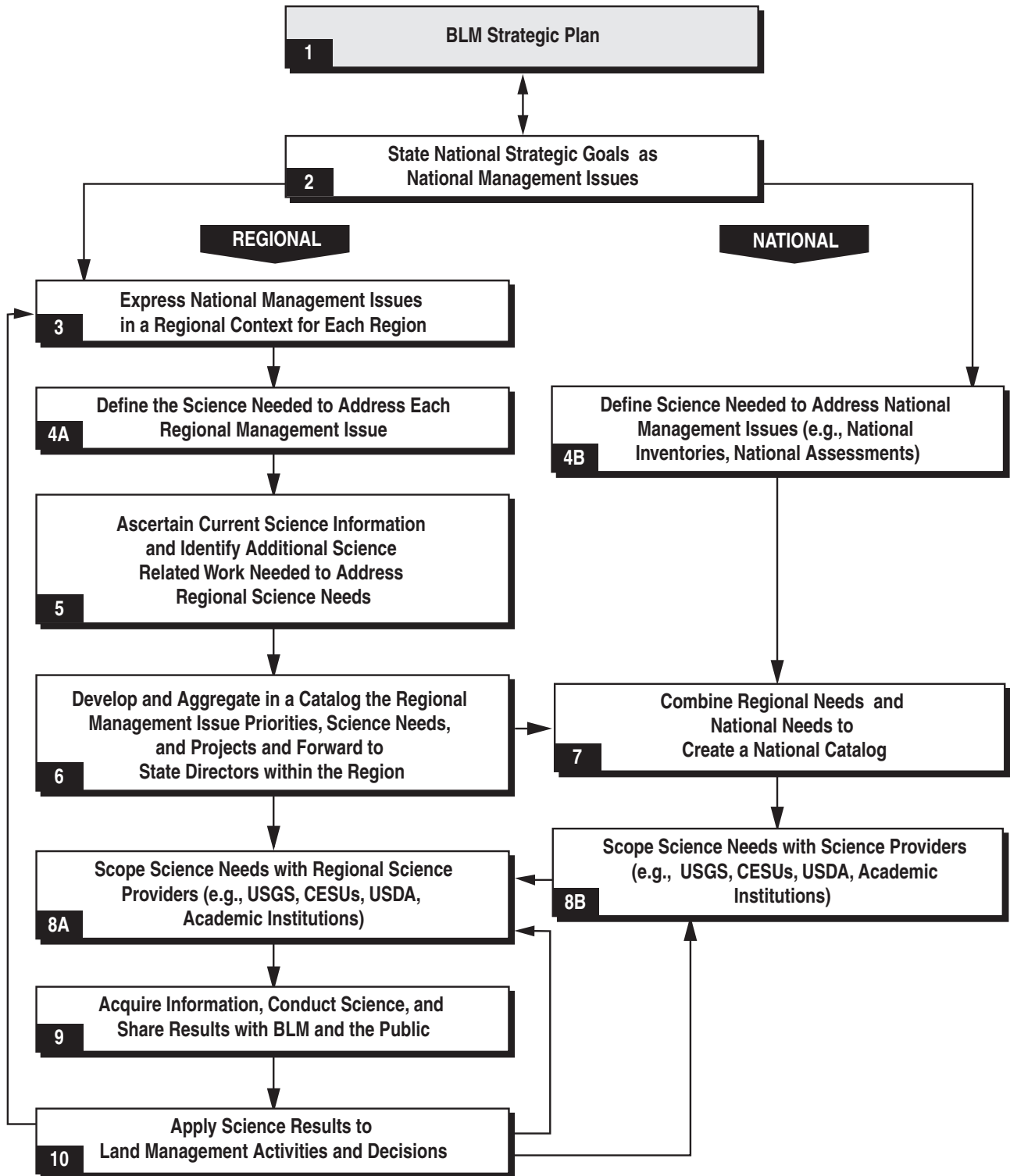


Figure 3. BLM's science process.

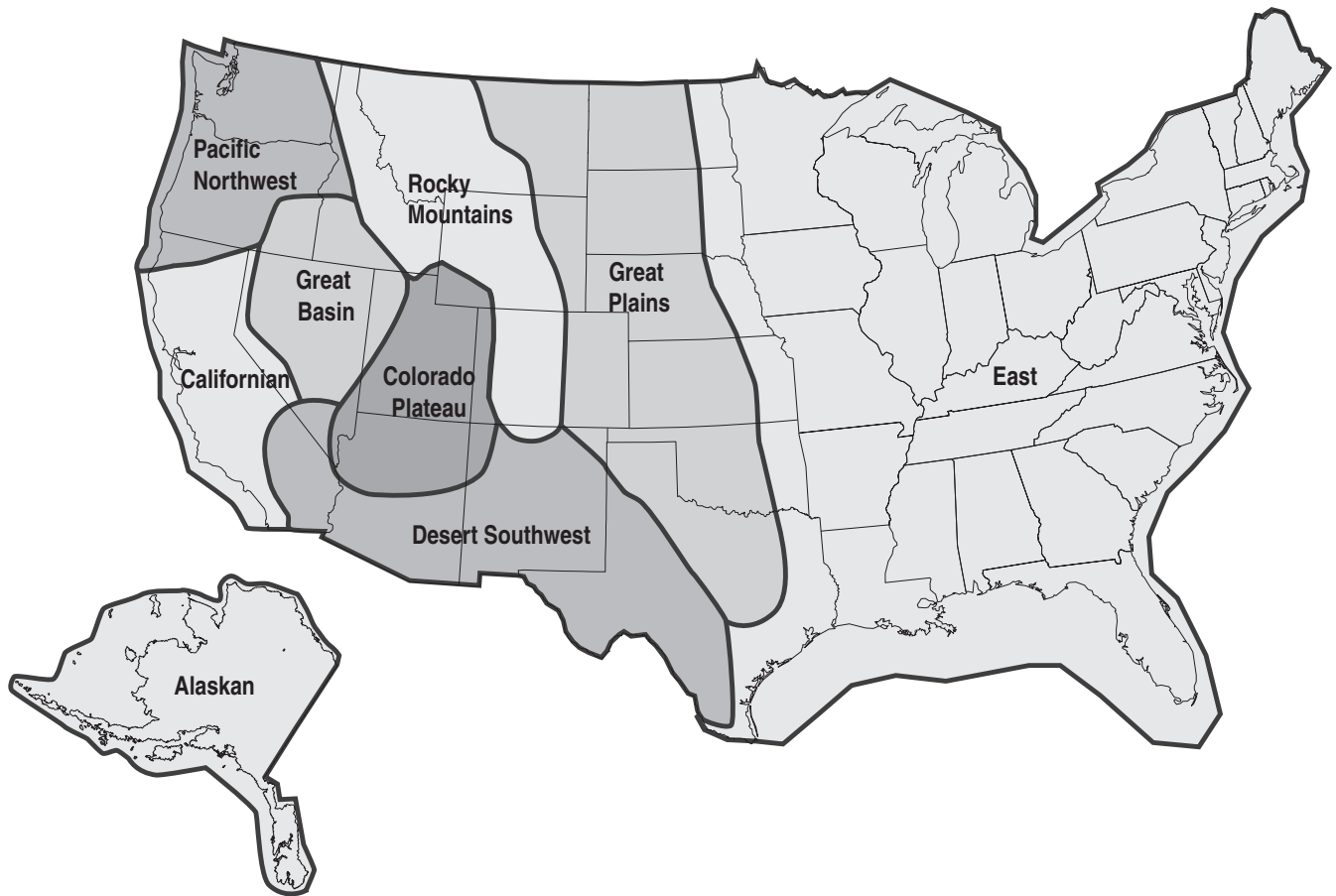


Figure 4. Biogeographic regions proposed for organizing science issues and needs.

Communicating Science Needs and Sharing Results

As noted in the previous section, communication and feedback are key elements in the Bureau's efforts to identify and prioritize BLM's science needs and to ensure science results/information are applied to land management activities and decisions. The Bureau needs to communicate three specific types of information:

- Management issues and science needs to potential science providers
- Science results/information to all internal/external audiences that could benefit from this information
- Science opportunities available on BLM-managed public lands (please refer to the following "Science Opportunities on the Public Lands" section)

Communicating BLM's Science Needs

The Bureau's science needs must be communicated both proactively and in response to specific data calls/other requests for information. The U.S. Geological Survey is the designated science bureau/provider for all bureaus in the Department of the Interior, so it is a primary partner in addressing BLM's science needs. Other potential science providers and partners include:

- USDI National Park Service and Fish and Wildlife Service
- USDA Forest Service, Agricultural Research Service, and Natural Resources Conservation Service
- Department of Energy
- Department of Defense
- Environmental Protection Agency
- National Marine Fisheries Service
- Multiagency institutes (e.g., Cooperative Ecosystem Studies Units, the Aldo Leopold Institute, etc.)
- State, local, and regional agencies/communities
- Indian tribes
- Professional societies and associations
- Nongovernmental organizations (e.g., The Nature Conservancy, foundations, etc.)
- Industry
- Academic institutions
- The general public

Each of the above organizations or groups may have several suborganizational levels and different levels of involvement; each will be addressed as needed.

Appropriate communication methods/media for communicating BLM's science needs include written plans (including the BLM science catalogue of needs described in the previous section); the

Internet (home pages, web links to science projects, bulletin boards, and comment pages); and PowerPoint and similar presentations.

In addition to these structured formats, the Bureau will encourage informal communications through telephone, e-mail, or face-to-face conversations with science providers and management partners on the ground to share information. Both formal and informal channels of communication will be kept open and encouraged to the maximum extent possible.

Important factors in communicating science needs include the following:

- Geographic scale (local, regional, or national)
- Time scale (less than 1 year, 1 to 5 years, or greater than 5 years)
- Subject matter or mix of science needs (natural resources, cultural/social resources and context, and physical/abiotic resources)

Timing of communication efforts is critical. Information will be communicated both as opportunities arise and according to defined schedules. The BLM will obtain more detailed knowledge of the planning and budgeting mechanisms for key divisions in the U.S. Geological Survey, Forest Service Research Stations, and other science providers. Information will be communicated at both the national and regional levels to these science provider organizations to coincide with their work planning and budgeting processes.

Lead times will vary for providing information. Some calls for information from science providers will incorporate enough lead time to prepare customized information packages. Other inquiries will require fast response times. In some instances, the Bureau will have to customize information presentations to address specific issues, audiences, etc. The BLM's national and regional science needs catalog will be a primary source for providing information to, and acquiring the services of, science providers.

Sharing Science Information and Research Results

Science information and research results will be communicated to BLM decision makers, resource specialists, the scientific community, and the general public in a clear, understandable, usable format. Key BLM internal audiences include the Washington Office, the Executive Leadership Team, the Field Committee, the Science Advisory Board, the Science Coordinating Committee, State Office program leads and science coordinators, Field Offices, staff managers (e.g., budget), Resource Advisory Councils, resource specialists, environmental impact statement teams, planning teams, regional groups, the Colorado Plateau group, the Northwest Forest Plan staff, the National Science and Technology Center (NS&TC), the National Interagency Fire Center (NIFC), and the National Training Center.

External national audiences include the National Research Council/National Academy of Sciences, the DOI Science Board, the National Science Foundation, Congress, the Office of Management and Budget, the Council on Environmental Quality, key user groups, and others.

Land management partners with whom the BLM should share science information and results includes the USDI National Park Service, Fish and Wildlife Service, Bureau of Indian Affairs, and Bureau of Reclamation; the USDA Forest Service and Natural Resource Conservation Service; the

Environmental Protection Agency; the Department of Defense; and the Department of Energy. Key audiences at the state level include fish and game agencies in the states where BLM has a presence, along with state geological surveys, lands boards, and commissions. At the local level, BLM must collaborate and share information with counties and municipalities.

Appendix 2 illustrates the concepts and issues discussed in this section.

Science Opportunities on the Public Lands

The 264 million surface acres of BLM-managed public lands provide a vast assortment of opportunities for scientific investigations. Specific opportunities include research natural areas (RNAs), national monuments, and other designated science areas, as well as nondesignated public land areas.

Research Natural Areas

Research Natural Areas (RNAs) are maintained as natural areas; only low-impact research activities are allowed. RNAs contain important ecological and scientific values and are managed for minimum human disturbance. They are used primarily for nondestructive sampling, non manipulative research, and baseline data gathering on relatively unaltered communities. They make excellent controls, allowing the establishment of baseline conditions for similar communities that are being actively managed. RNAs provide a network of diverse habitat types preserved in a natural state.

Research Natural Areas are administratively designated and do not require the approval of Congress. The BLM has designated approximately 150 RNAs, mostly through its area of critical environmental concern (ACEC) process.

National Monuments

The Grand Staircase-Escalante National Monument was created in September 1996 in part because of its exceptional scientific values. The Agua Fria, Grand Canyon-Parashant, and California Coastal National Monuments, created by Presidential Order in January 2000, also contain scientific opportunities. These four new national monuments total 2,965,100 acres.

Monument lands are protected by withdrawal from entry, location, selection, sale, leasing, or other disposition under the public land laws, except for valid existing rights and land exchanges that further the protective purposes of the monument. National Monument designation specifically prohibits the issuance of any new mineral leases.

The Bureau's monuments were created, at least in part, to preserve extraordinary scientific resources and landscapes. They were designated to protect the objects of historic or scientific interest that are situated upon them. Monuments contain significant geological, paleontological, archaeological, biological, and historical features.

With their often unique resources and values, as well as their similarities to many surrounding areas, BLM's four national monuments represent valuable open, natural laboratories. They will be managed to encourage collaborative science efforts, resulting in potentially significant advancements in natural resource knowledge.

Other Designated Areas for Research and Studies

The BLM occasionally designates research or study areas, often to accommodate the needs of research agencies. These are usually based on a need for scientific information on which to base management policy and decisions. Resource values to promote long-term ecological studies, monitoring, and assessment are often integral parts of the purpose of the designation. Multiple bureaus often work

together to acquire ecological, socioeconomic, and cultural knowledge and to apply that knowledge to managing public resources. Collaboration among the public, scientists, educators, and land managers to attain common objectives and goals is very important. This process helps to promote an understanding of complex ecological processes and enables the development of ways to meet the needs of people while maintaining both ecological and economic viability.

The BLM can authorize the creation and designation of study or research areas. Areas designated can be used for either low-impact or high-impact studies. Special-use permits and land-use changes may be required for high-impact experimentation, but usually the designation alone would not require any changes to the BLM land-use plan.

Scientific Use of Public Lands

Use of BLM public lands for research and scientific/environmental studies of many kinds would greatly benefit the Bureau's management of these lands. Within the scope of BLM's mission, these studies would be encouraged and the Bureau would collaborate with the investigator(s).

The BLM will investigate a protocol system for scientific-use registration. This protocol system would be reviewed by field offices to accommodate regional, state, or local needs and would require approval by the Director.

Appendix 1

BLM's Science Process

The process of identifying, prioritizing, and communicating the management issues and related science needs of the Bureau consists of the ten specific steps described below and illustrated in Figure 3.

Step 1. The Bureau's Strategic Plan, prepared using the procedures set forth in the Government Performance and Results Act, is the foundation document for the Science Plan and science application in the BLM. The Bureau's Strategic Plan sets forth the Bureauwide goals used to determine management issues and the science needed to address those issues.

Step 2. National strategic goals will be stated as national management issues. These national management issues will be derived from the background information that was used to develop the Strategic Plan goals, along with additional information input from National, State, and Field Office personnel.

Some of the identified national management issues will be addressed on a national basis (right-hand side of Figure 3), e.g., demographic changes in the U.S. population that will affect the recreational use of public lands, while others will need to be addressed in a regional context (left-hand side of Figure 3). Occasionally, a regional issue may become a national issue because of its importance. Even with this divergence, the process converges again later, making the national/regional approaches complementary and supportive of each other and the Bureau's overall program.

Step 3. National management issues will be expressed in a regional context, when appropriate. This step focuses the national management issues to reflect how they apply to the various biogeographic regions of the U.S. For instance, a national management issue might address invasive species. At the regional level, the management issue would include invasive species significant within that region. Invasive species may be a national issue, but the species of concern could vary from region to region.

Step 4A. The science needed to address the regional management issues will be defined. This may include existing resource inventory, monitoring, and other data, as well as new information derived from research/project efforts.

Step 4B. Similarly, science needs for national management issues requiring a national approach will be defined and addressed.

Step 5. An identification and assessment of the current science information and science projects for each management issue will be completed to determine where information gaps exist that need to be filled. This step will provide a list of the additional scientific information needed to fully address management issues. Short-term needs (to be met in less than one year), mid-term needs (a one- to five-year time frame), and long-term needs (more than five years) will all be addressed using the methods most likely to provide the required information in the appropriate time frame. During this step in the process, short-term local management issues and science needs, i.e., "tactical" science, may be identified and processed in a manner similar to the remaining steps 6, 8A, 9, and 10.

Step 6. The science information needs/gaps identified in steps 4 and 5 will be prioritized and assembled into a regional catalog that will form the basis for communicating the Bureau's regional science

needs in the steps below. Priorities will be approved by State Directors responsible for managing lands in each of the regions.

Step 7. Regional catalogs will be combined into one overall catalog that identifies science priorities at the national level. These priorities will be determined, in part, by the number of regions identifying the same management issues or science needs as high priorities, or by the possibility that a regional issue could become significant at the national level. Some of the regional needs may not be included in the national priority list; however, these will still be used at the regional level. When feasible, local tactical science needs will also be included.

The science catalogs will be used as a source document to respond to, and share BLM's science needs with, the Bureau's various science providers at both the national and regional levels. The catalogs can be used in various ways, depending on requests for information, avenues chosen for obtaining science information, and the purpose of the discussions. A complete discussion on communicating the Bureau's science needs is included in the section entitled "Communicating Science Needs and Sharing Results."

Step 8A. Regional and local tactical science needs will be scoped and provided to the best identifiable science providers available for the subject area being addressed. Regional science needs will most likely be addressed and scoped with science providers in the region. However, this may not always be true; some significant science providers for a subject area may be located outside a region. These individuals would be included in the effort to obtain the needed science information.

The U.S. Geological Survey is the primary science/research bureau for the Department of the Interior. Other significant providers include Cooperative Ecosystem Study Units, which are university partner networks established by Memorandums of Understanding with several bureaus for research, education, and information transfer.

Step 8B. National science needs will be scoped and provided to the best identifiable science providers available for the subject areas being addressed.

Step 9. Science will be conducted, information and data gathered, and the results shared with BLM managers and staff; information will also be made available to the public and any specific groups or individuals needing or requesting the information. Interpretation and translation may be required for very technical research/science information so that it can be understood and applied by specialists and managers (Refer to the "Communicating Science Needs . . ." section for additional information on this part of the Science Plan.) The results of this step will be fed back into the process and will be used to refine regional management issues.

Step 10. Science results will be used in land management activities and decisions. Applying science will improve land and resource management, helping the BLM in its efforts to sustain and improve the health, diversity, and productivity of our public lands. The BLM will feed back to the science providers, both at the regional and national levels, how the Bureau has used the science they provided. This will enable both the BLM and the science providers to evaluate the effectiveness and appropriateness of their contributions and allow BLM managers to modify decisions and management practices where appropriate.

Appendix 2

Examples of the Kinds of Information to Communicate

To illustrate the kinds of information to communicate, the two examples below show a simplified version of the steps of the science process, specific questions or issues, and audiences to be addressed. In actual on-the-ground situations, the issues and questions would be more complex and interactive than shown below.

SAGE GROUSE AND SAGEBRUSH STEPPE HABITAT (Regional Issue)

(The cells of the table would be filled with a series of appropriate statements/questions and answers; the information now included is very rough. Managers/specialist more knowledgeable of the issue will be asked to help fill in cells.)

COMMUNICATE	QUESTIONS OR ISSUES	SPECIFIC AUDIENCES
STEP(S) OF SCIENCE PROCESS		
2. Identify National Management Issues	Populations of some species and their habitat are decreasing to the point that the species may be listed under the Endangered Species Act	With input from Field Offices and State Offices, WO compiles a list of the national management issues related to enactment of the Endangered Species Act.
3. State National Management Issue in a Regional Context.	Sage grouse populations have declined on a range wide basis and there is concern about the health of sagebrush steppe ecosystems upon which sage grouse and other species are so closely dependent.	Regional teams, the BLM, and BLM's partners scope the regional context of the National management issue with the questions/issues to address
4A. Define the Science Needed to Address Regional Management Issues	<ul style="list-style-type: none"> – What are the “right” spatial dispersion patterns and relative amounts of the seasonally required habitats for sage grouse? – What are the relationships between habitat variation and sage grouse demographic variation? – What are the genetic definitions of subspecies and geographic distinctiveness of sage grouse populations? 	With the cooperation of partners, i.e., other land management agencies with lands adjacent to BLM having similar problems, scope projects needed to answer the questions

4A. *continued*

– What are the best restoration methodologies for rangelands invaded by annual grasses, for areas characterized by shrub cover dominance, and for degraded riparian-wetland and spring-seep areas?

5. Ascertain Current Science Information and Identify Science Needs	<p>– What is the “state of the science” related to the above (4A) key research questions?</p> <p>– Is there adequate information to account for variation in the wide-ranging sage grouse species and the widespread sagebrush steppe ecosystems of the western United States?</p>	Review available information and synthesize it to identify the information gaps and the additional information needed
6. Develop a Science Catalog		Catalog the needs, with input from Field and State Office personnel and regional interagency teams; compile needs on a regional basis; and assemble them into the national catalog
8A. Scope Science Needs with Providers	For the needs identified above, develop project plans in cooperation with the appropriate science providers	Probably the most relevant providers for these questions would be the U.S. Geological Survey, state fish and game agencies, and university researchers
9. Conduct Science and Share Results	Interpret and translate very technical research/science results into more usable information that specialists and managers can assimilate and readily incorporate into management.	Internal communication and information transfer to BLM staff specialists and managers; external communication with cooperative extension and education programs and Cooperative Ecosystem Study Units.
10. Apply Science to Land Management	Incorporate science information and results into Bureau policy and procedures and on-the-ground management. Modify land use plans as necessary.	Bureaus – BLM, Forest Service, National Park Service, Fish and Wildlife Service, state fish and game agencies, and private landowners

INVASIVE SPECIES (National Issue)

(The cells of the table would be filled with a series of appropriate statements/questions and answers; the information included is very rough. Managers/specialists who are more knowledgeable of the issue will be asked to help fill in cells.)

COMMUNICATE	QUESTIONS OR ISSUES	SPECIFIC AUDIENCES
STEP(S) OF SCIENCE PROCESS		
2. Identify National Management Issues	Invasive weeds have become a nationwide problem; in some areas native species are being replaced by the invaders. Populations of valuable range, pasture, and other plant species are being crowded out or reduced in productivity and value because of the invasions	With input from Field Offices and State Offices, WO compiles a list of the national management issues.
3. State National Management Issue in Regional Context	Two very important invasive species in the central and northern Great Plains region are leafy spurge and Russian olive. Both are spreading very rapidly and competing with native vegetation.	Regional teams, the BLM, and BLM's partners scope the regional context of the national management issue with the questions/issues to address
4A. Define the Science Needed to Address Regional Management Issue	<ul style="list-style-type: none"> – How do land management practices and development affect the opening of niches in the native vegetation to allow the invasion of the two species of concern? – What are the biological attributes of the invasives that allow them to invade and out compete the natives? – What biological characteristics may be used to exploit weaknesses in the life cycle for control of the species? 	With the cooperation of partners, i.e., other land management agencies with lands adjacent to BLM having similar problems, scope projects needed to answer the questions

4A. *continued*

– After various control measures are used in reducing the invasive populations, what revegetation and management practices be used to stimulate growth and production of desirable vegetation?

5. Ascertain Current Science Information and Identify Science Needs	<p>– What is the “state of the science” related to the leafy spurge and Russian olive invading vast acreages, particularly along riparian zones?</p> <p>– What is the mechanism of the competition or habitat conditions that allow or stimulate the invasion?</p> <p>– What is the mechanism of the plants biology and natural predators/consumers of the plants that may help develop control from further invasions?</p>	Review available information and synthesize it to identify the information gaps and the additional information needed
6. Develop a Science Catalog		Catalog the needs, with input from Field and State Office personnel and regional interagency teams; compile needs on a regional basis; and assemble them into the national catalog
8A. Scope Science Needs with Providers	For the needs identified above, develop project plans in cooperation with the appropriate science providers	Probably the most relevant providers for these questions would be university researchers, the Agricultural Research Service, and the U.S. Geological Survey.
9. Conduct Science and Share Results	Interpret and translate very technical research/science results into more useable information that specialists and managers can assimilate and more readily incorporate into management.	Internal communication and information transfer to BLM staff specialists and managers; external communication with cooperative extension and education programs and Cooperative Ecosystem Study Units,

10. Apply Science to Land Management	Incorporate science information and results into Bureau policy and procedures and on-the-ground management. Modify land use plans as necessary.	Bureaus – BLM, Forest Service, National Park Service, Fish and Wildlife Service, state fish and game agencies, and private landowners
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